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A note on zoogeographical
limits in South-East Africa,
as suggested by the avifauna

In a previous paper (Winterbottom, 1962), I suggested that the whole area of the East African littoral from Kenya to Knysna forms a single zoogeographical District, divisible into two or more sub-districts; and that the northern boundary of the southern sub-district lay in Zululand. In my map, I accepted the line drawn by McLachlan and Liversidge (1957), at about Sordwana Bay. Since my paper was written, there has been a Symposium on geographical distribution in Zululand (see, especially, Poynton, 1960, 1961) and the evidence from other groups of animals, as well as from plants, strongly suggests that the major faunal and floral change occurs further south, at St. Lucia; and that it is a much more substantial change than I had concluded from studying the birds. It therefore seemed worth while to re-examine the ornithological evidence with this opinion in mind.

In my previous paper, I reported that I had drawn up a list of 194 characteristic birds of northern Mozambique. "Of this list, 147 species (79 per cent) reach Zululand and 100 (52 per cent) Pondoland." This does not, in itself, suggest that the change taking place in Zululand is a major one, since 37 species drop out between northern Mozambique and Zululand and 47 between there and Pondoland; though the rate of loss is certainly very considerably accelerated (roughly one every three miles between the Tugela and the Untamvuna as against one every twenty miles between the Zambezi and the Usutu and one every sixteen miles between the Usutu and the Tugela).

Analysis of the southern limits of range of the 47 species which do not reach Pondoland gives the following results:

Four (*Cossypha heuglini*, *Corythaixoides concolor*, *Tchagra australis* and *Eremopteryx leucotis*) do not reach as far south in Zululand as St. Lucia.

Seven (*Batis fratrum*, *Nicator gularis*, *Eurystomus glaucurus*, *Mirafr rufocinnamomea*, *Bradornis pallidus*, *Nectarinia bifasciata* and *Eremomela icteropygialis*) stop at St. Lucia.

The remaining 36 species reach at least to the Tugela River and many of them further still.

Of the seven species which stop at St. Lucia, *Eremomela icteropygialis* reaches much further south (to the Olifants River) in the west.

There are four species (*Nectarinia neergardi*, *Apalis ruddi*, *Hypargos margaritatus* and *Serinus citriniceps*) whose range is confined to the area between Inhambane and St. Lucia and only the last-named of these does not reach St. Lucia. Thus the total number of species for which St. Lucia is the southern limit is nine, or ten if we count the *Eremomela*.

In my original assessment, I did not consider the water-birds. Of these, there are 20 species which occur south of the Tropic only in the coastal strip from Zululand to the Eastern Cape or even further south-west. Of them, only five (*Anastomus lamelligerus*, *Ephippiorhynchus senegalensis*, *Vanellus crassirostris*, *Sterna bengalensis* and *Ploceus xanthopterus*) reach their southern limit in Zululand; and only one of these, *Vanellus crassirostris*, has its limit at St. Lucia. *Anastomus lamelligerus* may, perhaps, be added, though it is not a regular inhabitant south of Ndumu.

While, therefore, a shift of the boundary between what I have called the East African Coastal and the Tropical Corridor* sub-districts from Zululand to St. Lucia can be supported on ornithological grounds and is obviously convenient to bring avifaunal divisions into correspondence with those based on other groups, bird distribution lends little support to the view that a major faunal change occurs at this point.

Poynton (1960) has shown that the distribution of Amphibia appears to be closely controlled by temperature and rainfall and not by vegetation (though this argument in respect of the south-west Cape seems to me insecurely based); and that there are two major constituents of the South African fauna, one tropical and the other centering on the south-west Cape. These concepts, unfortunately, do not fit bird distribution at all, despite Poynton's special pleading (1961). The major components of our bird fauna would seem to be a western, desert element, a northern savanna element, and a north-eastern forest and scrub element. There is also a montane-temperate element, whose relationship is difficult to assess but which would appear to be the result of an invasion from the north with some subsequent speciation in the south and south-west. This conforms to Levyn's view (1952) of the origin and affinities of the Cape flora, though amongst birds, evolution in the south has been very much less marked than in plants, or, apparently, than in Amphibia.

In this connection, however, we may note Acocck's view (1953) that the non-succulent part of the karoo flora has been derived from that of the south-west sclerophyll. This might imply that the western, desert avifauna of southern Africa has evolved from that of the sclerophyll, with which it has still obvious affinities; that the much greater differentiation in sclerophyll plants, as contrasted with birds, is related to the small geographical area of the sclerophyll and the relatively immensely greater mobility of birds; and that the severe conditions of the desert have prevented a rich Amphibian fauna from differentiating there, as it has in the sclerophyll. This last is an example of the differences likely to arise in severe environments between homoiothermal and poecilotheothermal animals.

If this interpretation be correct, then the equivalent of Poynton's Temperate fauna in birds is the whole South-West Arid District, as I have defined it, much of which falls into one or other sub-division of Poynton's Transitional Zone (chiefly his Western Temperate Transitional and the "subtraction transitional" area between that and his Western Tropical Transitional) when the Amphibia are taken as the basis.

It is interesting to compare this situation with that of the Winter Rainfall area in Australia, and particularly in Western Australia. A study of Gentilli's paper (1949) makes it clear that the sub-humid, and even the semi-arid, areas of western and south Australia are divided by an arid belt which reaches the coast of the Great Australian Bight and isolates the two areas (his Maps 5, 6, 7 and 11), though this isolation is now somewhat less than in the early Recent. No such isolation occurs in South Africa, where sub-humid climates and vegetation patterns link the humid and forested areas to the west and east, though it is possible that in the last arid period, such isolation did exist in the Port Elizabeth area, where the present annual precipitation effectiveness is 35 (the dividing line between sub-humid and semi-arid). Poynton has pertinently pointed out to me (*in litt.*) that the term "Tropical Corridor" is misleading, as it implies a connection between two other areas, whereas the area so designated by Gill and by me, is a progressively attenuated extension of the tropical area at one end and terminates abruptly at the other. Another name will have to be found.

arid being 32) and karoo types of vegetation approach to within 40 miles of the coast. Even this, however, would only isolate the sub-humid areas, whereas in Australia, the semi-arid areas are isolated likewise. Nevertheless, there are some indications of a dicentric pattern, similar to that shown by a number of Australian birds, in South Africa, as in *Promerops* (*caffer* in the west, *gurneyi* in the east) and *Chaetops* (*frenatus* in the west, *aurantius* in the east). But it would take us too far from the main subject of this paper to pursue the point further here.

SUMMARY

1. It is concluded that, in birds, the division between the northern and southern sections of the East Coast Faunal Province should be brought south to St. Lucia Bay.
2. In birds, however, this is not a major boundary.
3. It is suggested that the avian equivalent of the amphibian "temperate fauna" is that of the whole South-West Arid District.
4. The African south-west corner has never been as isolated as the Australian south-west; but some indications of isolation can be detected.

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DISCUSSION

- Dr. Stuckenberg*: With reference to Acock's view on the non-succulent part of the Karoo flora, it may be added that he believes that the succulent component was derived from the Fish River flora. However, I doubt whether the Cape flora and birds should be spoken of in the same breath as one is so very much older than the other. Regarding avifaunal boundaries on the east coast, there was a recent statement by Vincent that a large number of bird species have withdrawn from Natal (following agricultural expansion) into Zululand. There is historical evidence of a similar withdrawal of certain invertebrates. Finally, I would like to suggest that the importance of the Zambezi on the Moçambique plain is often underestimated. It certainly forms a natural boundary for invertebrates, not simply as a river, but probably because the north bank is not well-forested whereas the south bank is.
- Dr. Winterbottom*: The withdrawal of various animals from Natal into Zululand seems to support my view that this is not a major boundary.
- Dr. Theiler*: In considering distribution patterns it is easy to overlook the influence of differences on a vertical scale. The environment at soil level may be very different to the environment in the same place, a few feet above the ground. Amongst the ticks, which often have distribution patterns entirely independent of the distribution of their mammalian hosts, a boundary does exist at St. Lucia. Perhaps the differences of opinion between the students of amphibia and birds may simply be the result of dealing in different environments, one at soil level and the other above it.
- Dr. Meester*: For each animal there may be a different set of factors producing different areas of distribution. It would seem that we are not yet at a stage to lay down rules for groups, but must still concentrate on understanding individual species patterns, rather than attempt interpretation on a large scale.